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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/712,775	11/14/2003	Donggyun Han	2557-000216/US	7409
30593	7590	11/30/2006	EXAMINER	
HARNES, DICKEY & PIERCE, P.L.C.			ALANKO, ANITA KAREN	
P.O. BOX 8910			ART UNIT	
RESTON, VA 20195			PAPER NUMBER	

1765

DATE MAILED: 11/30/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/712,775

Applicant(s)

HAN ET AL.

Examiner

Anita K. Alanko

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 9/15/06 - RCE & amdt.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-30 and 51-60 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-30 and 51-60 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 9/15/06 has been entered.

Drawings

The drawings were received on 9/15/06. These drawings are acceptable.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-2, 4, 6-8, 11-16, 19-21, 23-24, 28-30, 51-60 are rejected under 35 U.S.C. 102(e) as being anticipated by Mullee (US 6,306,564) as evidenced by Chandra et al (US 2002/0014257 A1) or WO 02/11191 A2.

Mullee discloses a method comprising:

sequentially treating the photoresist with a first reactant (supercritical carbon dioxide, col.4, lines 37-39) to cause swelling, cracking or delamination of the photoresist (since it is the

same reactant as in the instant invention, the same results such as swelling are expected as evidenced by Chandra ([0078]) or WO 02/11191 A2 (page 26, line 1));

subsequently (since the second step is after the first step, and, for example, for a different time period col.4, lines 58-60) treating the photoresist with a second reactant (ozone, col.4, line 15) to chemically alter the photoresist (since it is the same reactant as in the instant invention, the same results such as chemically altering are expected, as evidenced by WO 02/11191 A2 (see page 26, lines 1-3)), (col.4, lines 58-60, e.g. the two removal steps (col.4, lines 67-col.5, line 1) encompass sequential treating steps); and

subsequently removing the chemically altered photoresist with a third reactant (deionized water, col.5, lines 17-23).

However, Mullee inherently has treating with a first reactant, to cause swelling. Thereafter, the swelling allows for the subsequent, second treatment to be successful, i.e., for chemically treating or oxidizing (as evidenced by WO 02/11191 A2 at page 26, lines 1-3).

As to claim 19, the steps are not limited to any specific order, therefore, as broadly cited, Mullee discloses all of the steps. Note that reactants are not defined, and therefore the first and second reactant can be the same, for example an ozone and supercritical carbon dioxide mixture.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Mullee (US 6,770,426) in view of Vaartstra (US 6,770,426), Liu and Shibata.

The discussion of Mullee from above is repeated here.

As to claim 3, Mullee does not disclose ion implantation. However, Mullee discloses that the photoresist to be removed includes that used for the manufacture of semiconductor devices. Vaarstra teaches that ion-implanted resists are commonly formed during the manufacture of semiconductor devices (col.6, line 56). Liu and Shibata teach that ion implantation at the cited dosages are useful to enable the usage of thinner photoresists, which is useful for forming interconnections (see abstracts). It would have been obvious to use the cited dosage in the method of Mullee because Vaarstra teaches that resist to be removed includes ion-implanted resist and Liu and Shibata teach that the dosages cited are useful to enable the usage of thinner photoresists, which is useful for forming interconnections.

Claims 5, 17 and 22 rejected under 35 U.S.C. 103(a) as being unpatentable over Mullee (US 6,770,426) in view of Vaartstra (US 6,770,426).

The discussion of Mullee from above is repeated here.

As to claims 5, 17 and 22, Mullee discloses a pressure range of 2000-6000 psi that encompasses the cited pressure range (col.3, line 62 - col.4, line 3), however Mullee discloses a temperature of up to 80 °C (col.4, line 2), which is lower than the cited range of 100-150 °C.

Vaartstra teaches that a useful temperature range for using supercritical gases to remove photoresist includes 30 – 250 °C (col.7, line 58), which encompasses the cited range of 100-150 °C. It would have been obvious to one with ordinary skill in the art to operate at the cited temperature range in the method of Mullee because Vaartstra teaches that this is a useful temperature range for using supercritical gases to remove ion-implanted photoresist.

Claims 9-10, 18, 25-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mullee (US 6,770,426).

The discussion of Mullee from above is repeated here.

As to claims 9-10, 18, 25-27, Mullee does not disclose the parameters of the ozone, however temperature, pressure and concentration are all variables that effect how quickly ozone can chemically react. Thus, it would have been obvious to one with ordinary skill to operate at the cited parameters in the method of Mullee in order to get a process that works to effectively remove photoresist, or because they appear to reflect result-effective variables which can be optimized. See MPEP 2144.05 IIB.

Response to Amendment

The claim 13 objection is withdrawn in view of applicant's remarks that normal photoresist may be removed which is not hardened.

The claim rejection over Vaartstra is withdrawn since Vaartstra does not disclose that the steps are subsequent, as in amended claim 1. The claims remain rejected over Mullee.

Response to Arguments

Applicant's arguments filed September 15, 2006 and July 17, 2006 have been fully considered but they are not persuasive, to the extent they still apply.

As to amended claim language, Vaarstra does not disclose the subsequent steps. However, Mullee does disclose subsequent steps since a first step with a first reactant is conducted for 30 seconds, a second step with a second reactant is conducted for 30 seconds, and then a third step is conducted to rinse the substrate, as in the context of claim 1.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anita K. Alanko whose telephone number is 571-272-1458. The examiner can normally be reached on Mon-Fri until 2:30 pm (Wed until 11:30).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 571-272-1465. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Anita K. Alanko

Anita K Alanko
Primary Examiner
Art Unit 1765